

Forecasting for Water Resources Planning



**US Army Corps
of Engineers®**

Forecasting for Water Resources
Planning



Learning Objective(s):

- ◆ **The student will:**
- ◆ Understand the need for forecasts.
- ◆ Be able to describe what a scenario is.
- ◆ Know when/why assumptions are used in forecasts and scenarios.



What is a forecast?

- ◆ It is a more or less informed judgment about the future, future condition(s), or scenario.




Why forecast?

- ◆ We forecast to project or assess possible future conditions that are often uncertain so we can formulate plans and provisions in the present to accommodate evolving circumstance and uncertainties in the future.



What do we forecast?


- ◆ We forecast variables, combinations of variables, and scenarios.



What do we use in forecasting?

- ◆ Information
 - Data
 - Fact(s)
 - Evidence of all types
- ◆ Technique(s)
 - Qualitative vs. Quantitative
- ◆ Knowledge
- ◆ Expertise and experience

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And less informed forecasts?

- ◆ Assumptions enter the picture.
- ◆ When uncertainty is significant so is the criticality of corresponding assumptions.
- ◆ The information and input that inform(s) a forecast reduce uncertainty, assumptions address the remaining uncertainty.



So, forecasts are based on . . .

- ◆ Certainties and foreseeable developments and occurrences.
- ◆ Reasonable certainty & expectation. (i.e. fairly certain “stuff”)
- ◆ Assumptions about less certain developments or events.
(less certainty and greater potential for variance)
- ◆ Considerations of time.....




How do we choose the variables we forecast?

- ◆ Variables are factors or conditions of our existence or circumstance that are uncertain & subject to change.
- ◆ When the future value of a variable might significantly affect our well being or the decisions we make, it is worth forecasting.
- ◆ The variables we emphasize for forecasting are those that matter in making decisions, i.e., they are important now or in the future.




What does a scenario look like?

- ◆ It is information about a possible future condition.
- ◆ That information can take any and all of the typical forms:
 - Raw data – vessel calls at a port
 - Graphics – frequency curve
 - Narrative text
- ◆ It is a story about what might or could be.
- ◆ A variety of formats and contexts may be employed to convey underlying or implicit relationships of the scenario.




What are typical scenarios?

- ◆ Historic condition – what was.
- ◆ Existing condition – what is.
- ◆ Base period condition – what will be or is expected at the time of implementation.
- ◆ Without-condition – what might be if a Federal/non-Federal partnership takes no action.
- ◆ With-condition – what might be if a particular course of action is undertaken.




What is the without condition?

- ◆ A critical forecast in any water resources planning analysis.
- ◆ The future is rarely like the past or present.
- ◆ It does not literally mean to do nothing; it is the most probable or expected course without implementation of a specific action.
- ◆ It is the scenario that will most likely prevail if the Federal/non-Federal partnership takes no joint action.
- ◆ Synonymous with NEPA “No action.”



What are the with conditions?

- ◆ It is the scenario that will most likely prevail if the Federal/non-Federal partnership takes a specific joint action to solve a given problem.
- ◆ There is one most likely with-condition for each alternative plan.



How do we address uncertainty in forecasts?


- ◆ For variable forecasts we use quantitative & statistical methods.
- ◆ For scenarios we use sensitivity analysis to explore alternative assumptions.
 - Single-variate
 - Multi-variate



How far into the future do we forecast?

- ◆ In water resources planning forecasts are made for the entire planning horizon with emphasis for refinement relative to variable criticality and timing.
- ◆ Often the same or similar for all alternatives, but it can vary from project to project.

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What do we do with the forecasts?

- ◆ We examine them to determine their significance or applicability.
- ◆ We compare them to identify differences between scenarios.
- ◆ Employed for economic benefit computations and derivation or adjustment of project specifications.



Differences in what?

- ◆ Qualities and impact(s) of occurrence.
- ◆ Likelihood or probability of occurrence.
- ◆ Contributions to achievement of planning objectives.



How do we compare forecasts?

- ◆ With and without analysis – required by USACE Guidance (P&G, 1105-2-100, etc.)
- ◆ Before and after analysis – compare existing to with-condition, typical with environmental impact assessment.
- ◆ Gap analysis – compare with-condition to a target, the difference is a gap or margin to be overcome or assessed for possibility or probability of “closure.”



Summary:

- ◆ When do we need forecasts?
- ◆ What makes up a scenario?
- ◆ Why are assumptions needed in forecasting?